

### **In the Specification**

Please amend paragraph 19 as follows:

FIG. 2 illustrates a schematic of the loop filter circuit 2 in relation to the main charge pump circuit 5 and the auxiliary charge pump circuit 8, in accordance with embodiments of the present invention. The loop filter circuit 2 comprises a first capacitor 4, a second capacitor 18 (e.g., filter capacitor), and a resistor 12. The first capacitor 4 is electrically connected to the resistor 12. The resistor 12 is electrically connected to the second capacitor 18. The first capacitor 4 is in parallel with the resistor 12 and the second capacitor 18. The resistor 12 comprises a fixed resistance R1. The first capacitor 4 comprises a fixed capacitance C1. The second capacitor 18 comprises a fixed capacitance C2. The main charge pump circuit 5 may inject (i.e., source) current to the loop filter circuit 2. Alternatively, the main charge pump circuit 5 may remove (i.e., sink) current from the loop filter circuit 2. The source or sink function of the main charge pump circuit 5 may be controlled by a user. The auxiliary charge pump circuit 8 is electrically connected to the loop filter circuit 2 in parallel with the second capacitor 18. The auxiliary charge pump circuit 8 may inject (i.e., source) current to the second capacitor 18. Alternatively, the auxiliary charge pump circuit 8 may remove (i.e., sink) current from the second capacitor 18. The source or sink function of the auxiliary charge pump circuit 8 may be controlled by the user. The main charge pump circuit 5 may comprise an adjustable gain control 7 so that the user may vary a current gain of the main charge pump circuit 5 ( $G_m$ ). The auxiliary charge pump circuit 8 may comprise an adjustable gain control 9 so that the user may vary a current gain of the main charge pump circuit 5 ( $G_a$ ). By changing the current gain  $G_a$  of the auxiliary charge pump circuit 8 in relation to the current gain  $G_m$  of the main charge pump circuit

5, an effective capacitance value of the second capacitor 18 ( $C_{eff}$ ) may be controlled. The effective capacitance value  $C_{eff}$  is a value of capacitance that the second capacitor 18 appears to have. Although the second capacitor 18 comprises the fixed capacitance value  $C_2$ , the effective capacitance  $C_{eff}$  value is higher or lower than the fixed capacitance value  $C_2$ . By changing both gains  $G_a$  and  $G_m$  relative to each other, a wide range of effective capacitance values  $C_{eff}$  for the second capacitor 18 is obtained. When the main charge pump circuit 5 and the auxiliary charge pump circuit 8 both flow current in a same direction (i.e., the main charge pump circuit 5 and the auxiliary charge pump circuit 8 both sink current or both source current), a value for  $C_{eff}$  is determined by the following first equation:  $C_{eff} = (C_2 * G_m) / (G_m + G_a)$ . Using the first equation,  $C_{eff}$  decreases as  $G_a$  increases. When the main charge pump circuit 5 and the auxiliary charge pump circuit 8 each flow current in opposite directions (i.e., the main charge pump circuit 5 sinks current and the auxiliary charge pump circuit 8 sources current or vice versa), a value for  $C_{eff}$  is determined by the following second equation:  $C_{eff} = (C_2 * G_m) / (G_m - G_a)$  with a limitation that  $G_a < G_m$ . Using the second equation,  $C_{eff}$  increases as  $G_a$  increases. It is readily apparent that if both  $G_m$  and  $G_a$  are varied, then  $C_{eff}$  can be varied over a wider range than if just  $G_m$  or  $G_a$  is varied. For example, if  $G_m = 1$ ,  $G_a = .5$ , and  $C_2 = 350$  picofarads (pF) then using the first equation produces a  $C_{eff}$  of 233pF and using the second equation produces a  $C_{eff}$  of 700pF thereby giving  $C_{eff}$  a range of 233pF-700pF. The variation of  $C_{eff}$  allows for optimization of phase lock loop circuit 1 parameters such as, inter alia, bandwidth, peaking/damping factor (?), noise reduction, etc. A relationship between the damping factor ? and  $C_{eff}$  and is shown by the following equation: